REINVENTING FIRE: CHINA

A ROADMAP FOR CHINA'S REVOLUTION IN ENERGY CONSUMPTION AND PRODUCTION TO 2050

重塑能源：中国

面向2050年能源消费和生产革命路线图研究

REPORT RELEASE

12 OCTOBER 2017

ENERGY RESEARCH INSTITUTE

ROCKY MOUNTAIN INSTITUTE

BERKELEY LAB

ENERGY FOUNDATION
能源基金会

A ROADMAP FOR CHINA'S REVOLUTION IN THE CONSUMPTION AND PRODUCTION OF ENERGY

- 3 years of scientific research
- 4 partner joint US-China research team
- Analyzed cost-effective technology opportunities
- Created solutions roadmap

RIGOROUS AND INNOVATIVE SOLUTIONS TO DEFINE A LOW CARBON PATHWAY

6× GDP

Chinese economy increases 6 times by 2050

+1% Primary Energy

Using about the same amount of energy as today

55% non-emitting*

Over half from non-fossil energy

-42% CO_2 emission

Yielding 42% reduction in CO_2 emissions from 2010

¥21 Trillion net benefit

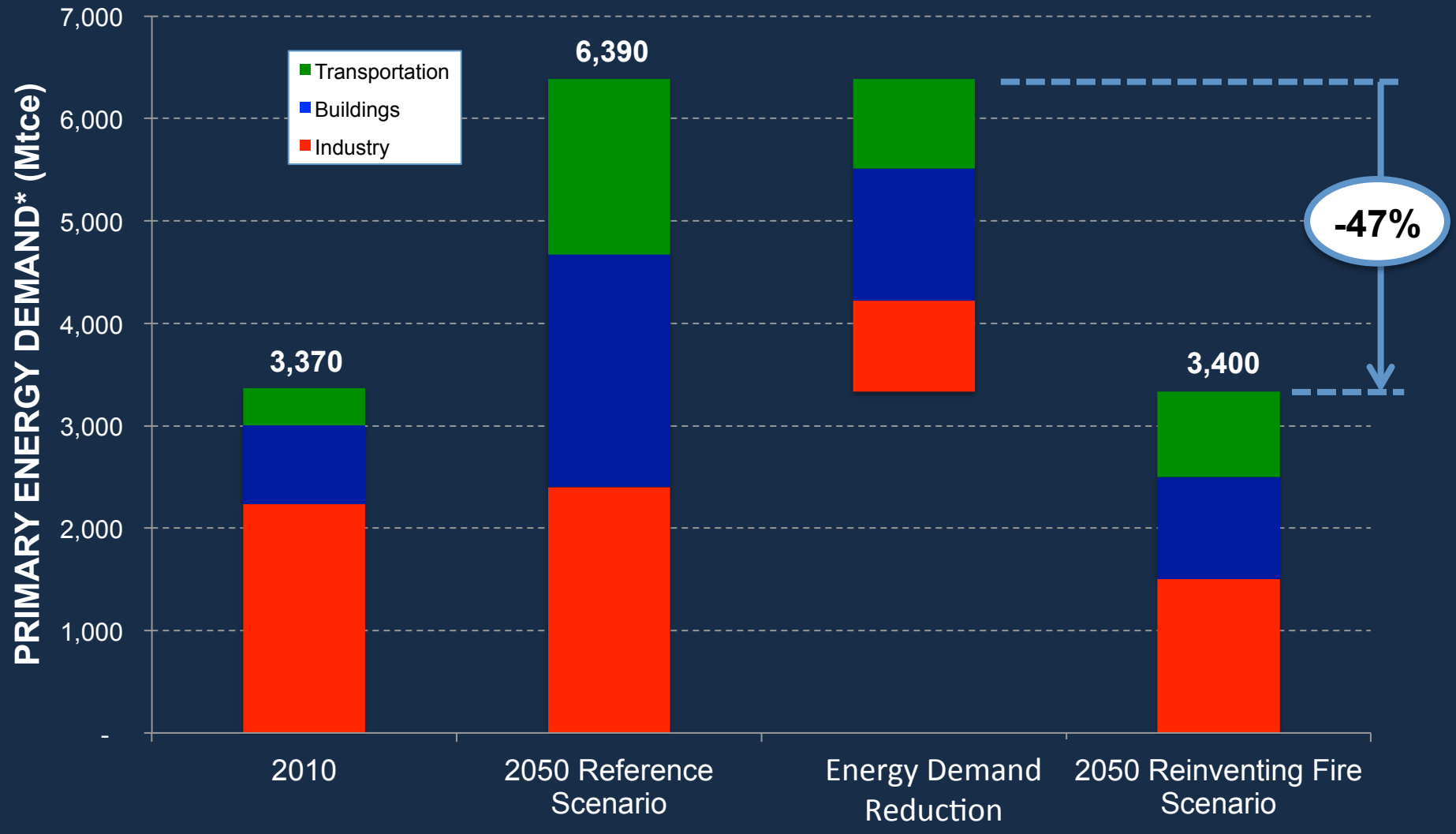
Requires ¥35 Trillion investment for ¥56 Trillion benefit, excluding environmental gains

100%
Technically feasible, cost-effective and socially acceptable

* Primary electricity converted using coal power plant equivalent, in accordance with China's pledged target; 35% if using direct equivalent method (consistent with IPCC)

Source: Reinventing Fire: China team analysis

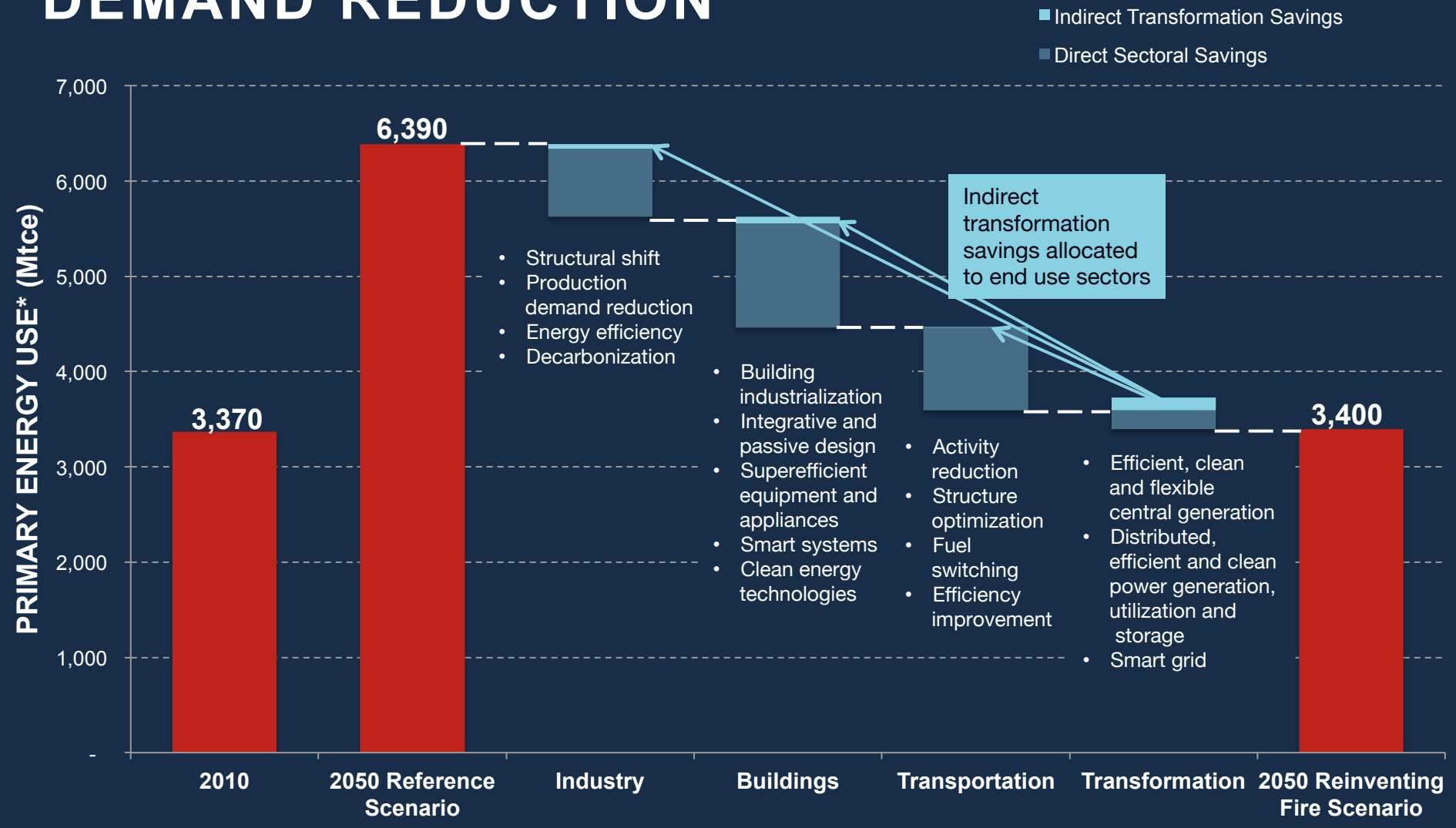
STEP 1: DECOUPLING ENERGY DEMAND THROUGH IMPROVED EFFICIENCY



* Primary electricity converted using the direct equivalent method (consistent with IPCC).

Source: Reinventing Fire: China team analysis

SECTOR-BASED STRATEGIES TO DELIVER DEMAND REDUCTION



* Primary electricity converted using the direct equivalent method (consistent with IPCC).

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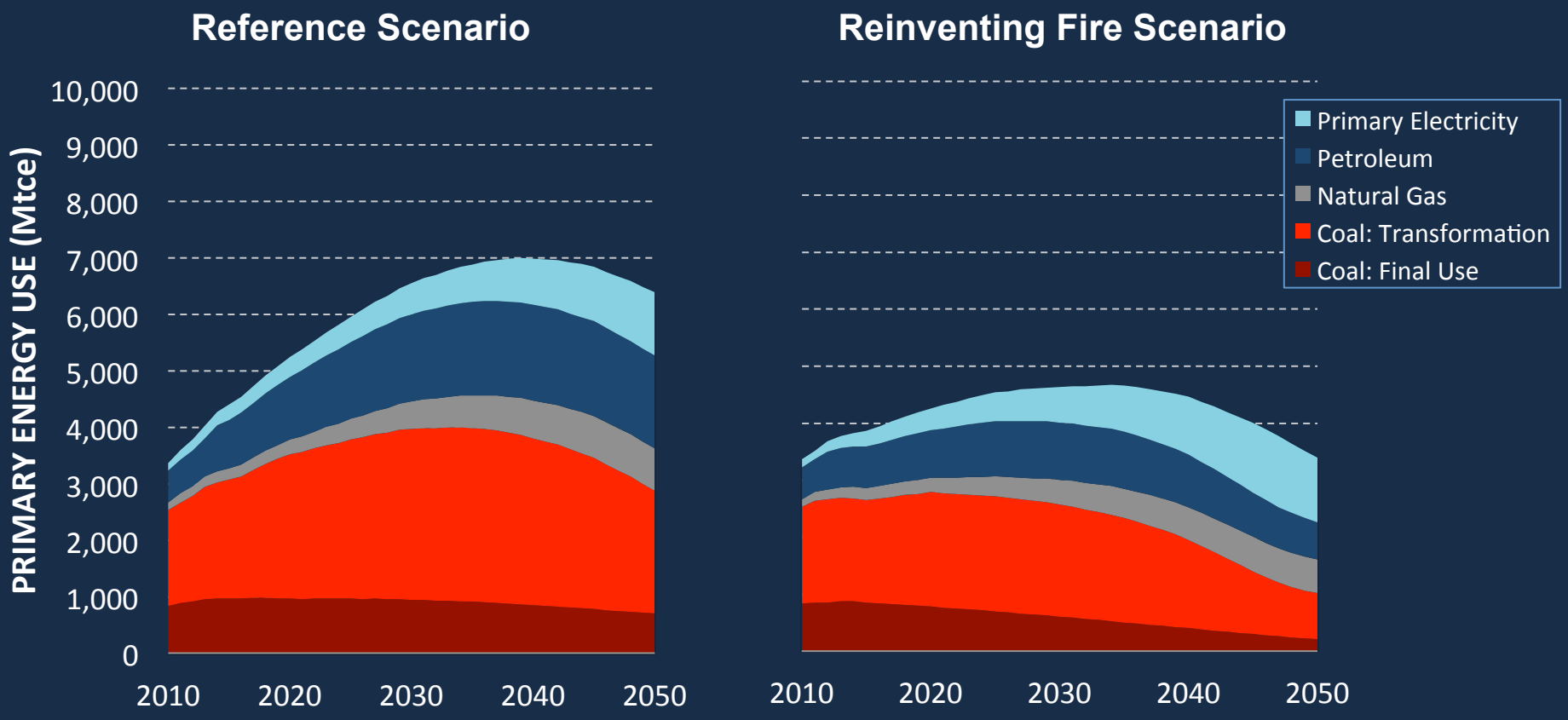
STEP 2: SHIFTING SUPPLY TO NON-FOSSIL SOURCES



Share of non-fossil primary energy

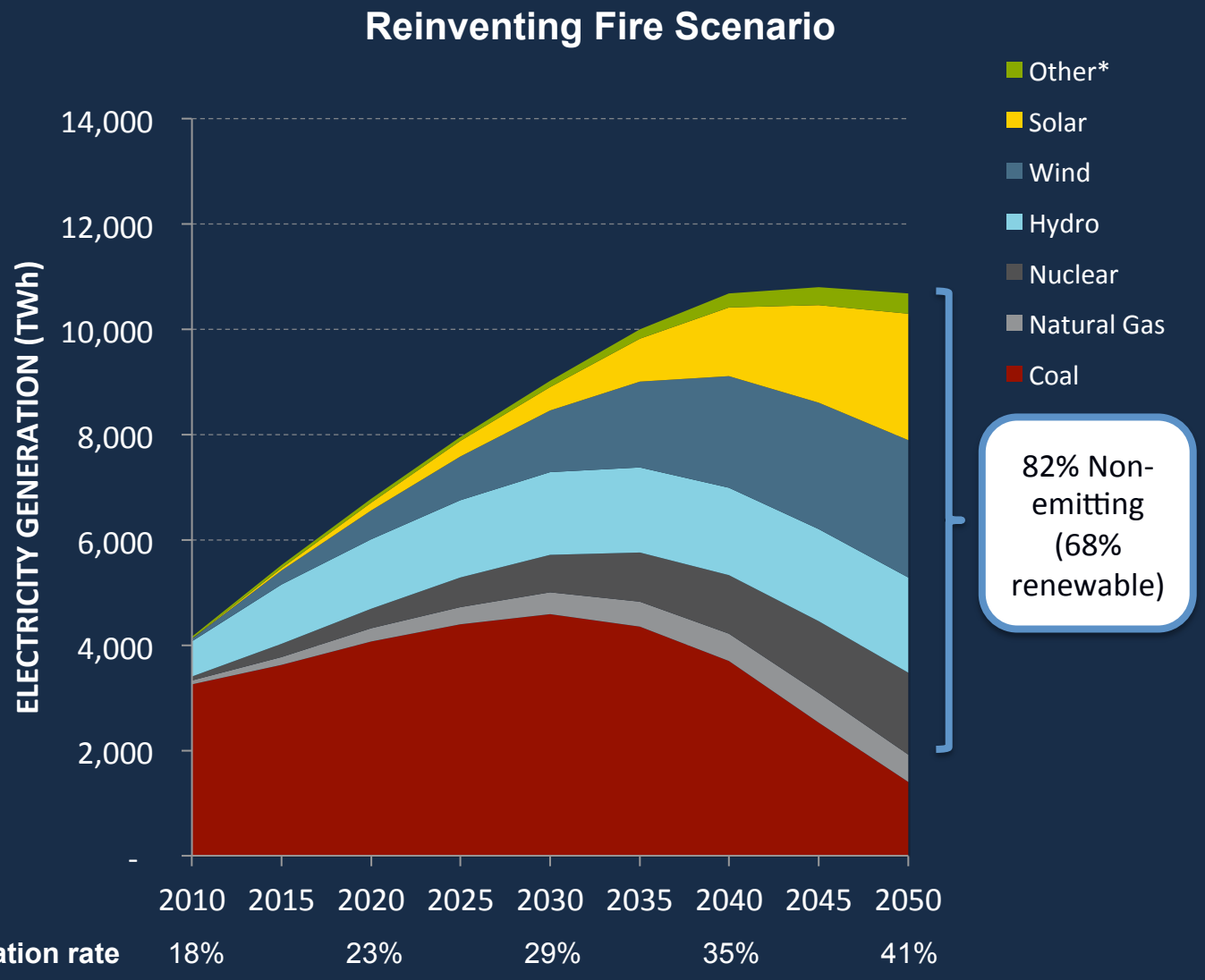
	2010	2020	2030	2040	2050
IPCC	4%	7%	8%	12%	18%
CPCC	11%	17%	21%	28%	38%

2010	2020	2030	2040	2050
4%	9%	13%	23%	34%
11%	21%	28%	42%	55%

* Primary electricity converted using the direct equivalent method (consistent with IPCC).

Source: Reinventing Fire: China team analysis

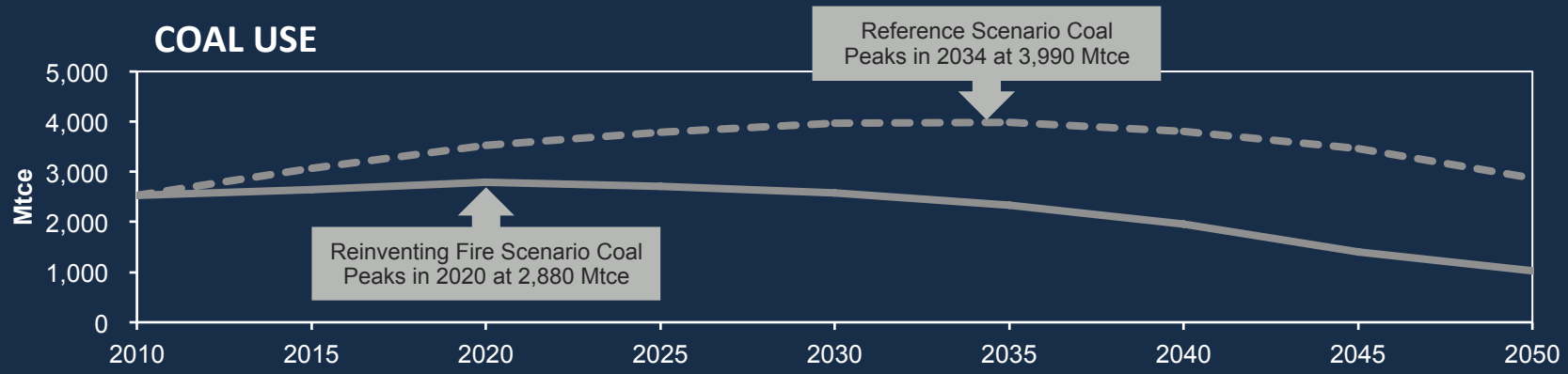
ELECTRIFICATION AND TRANSFORMING GRID ARE CRITICAL

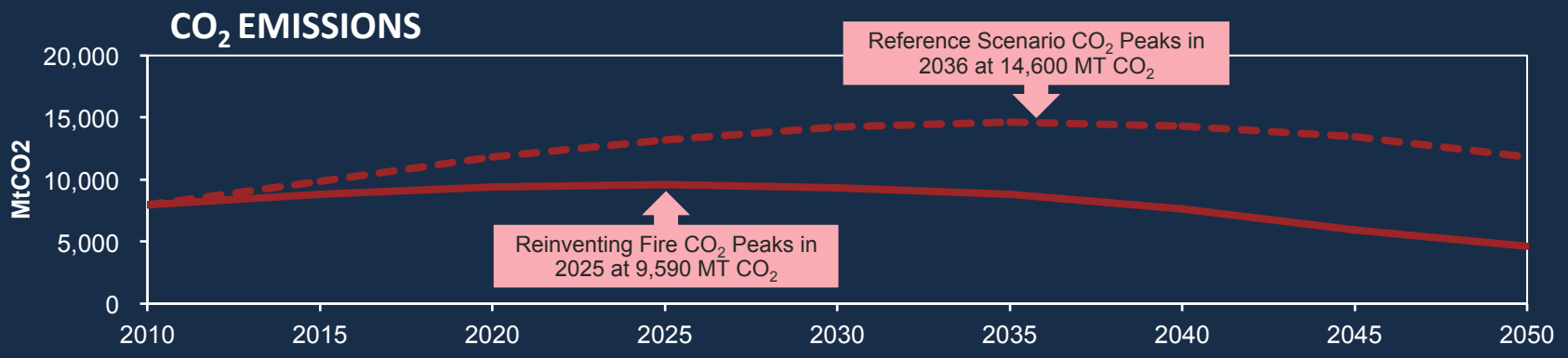


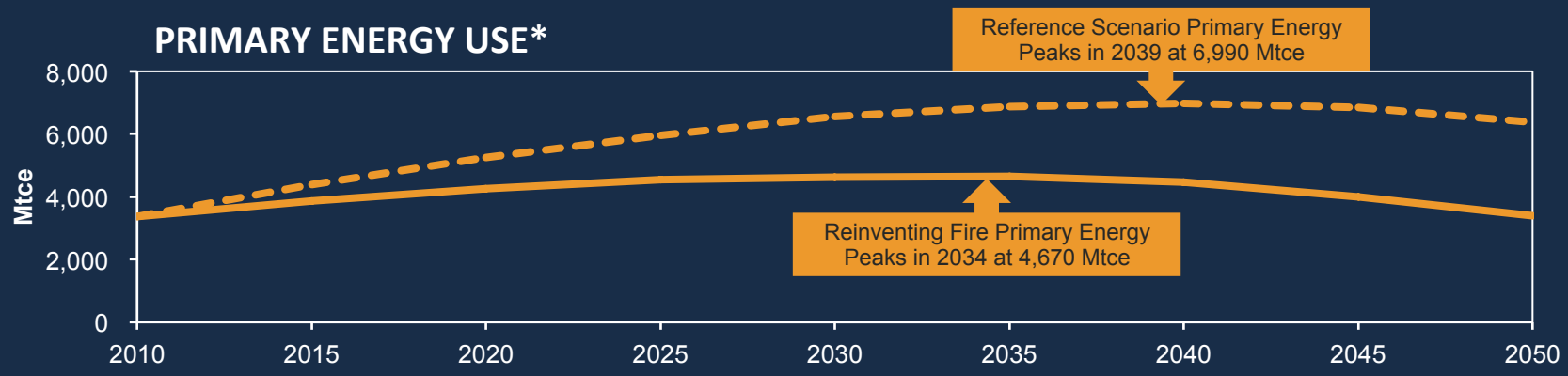
* Other includes waste to electricity, biogas, straw, wood, geothermal, and ocean energy

Source: Reinventing Fire: China team analysis

THE RESULT: EARLIER AND LOWER PEAKS



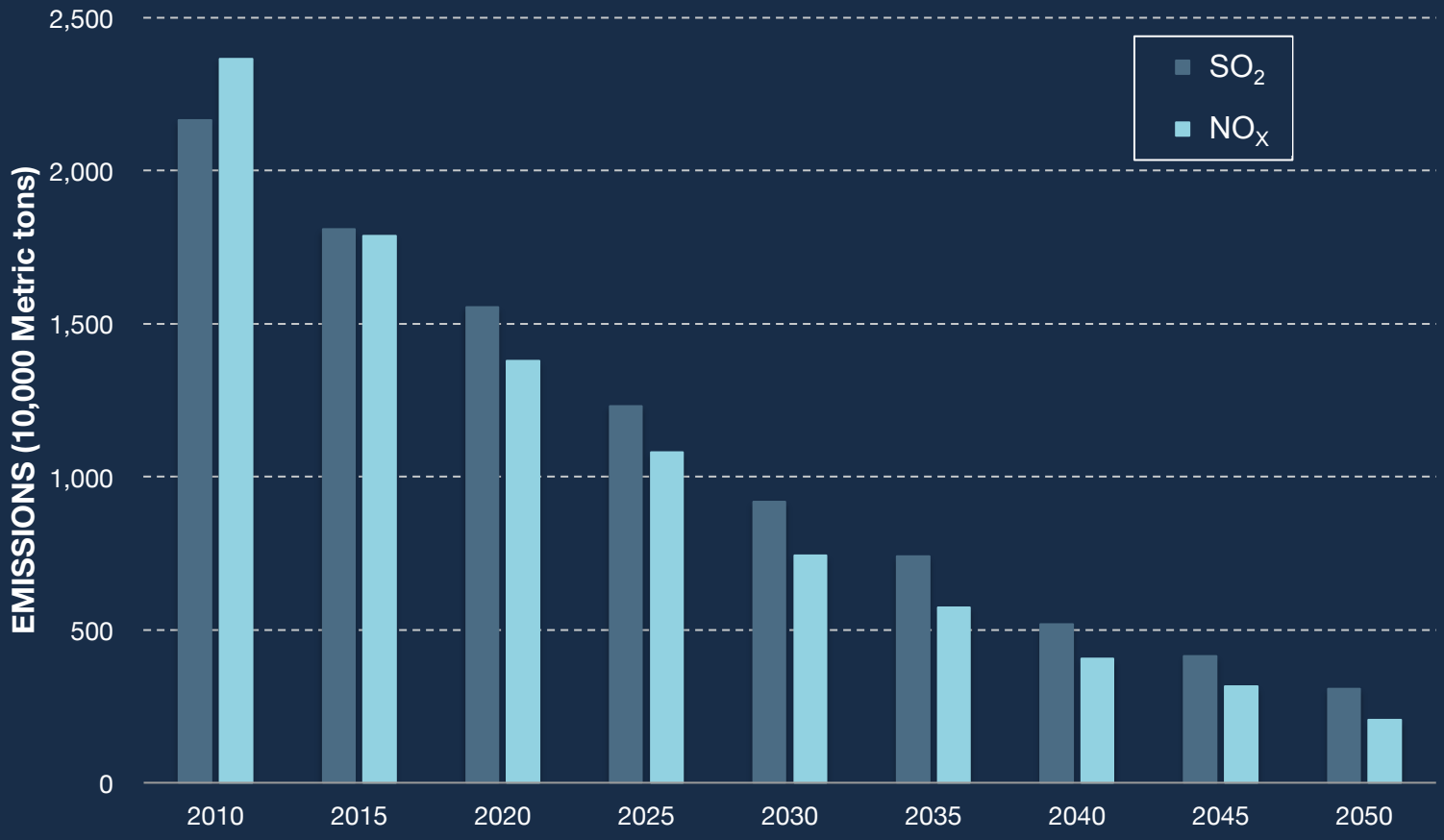




* Primary electricity converted using the direct equivalent method (consistent with IPCC).

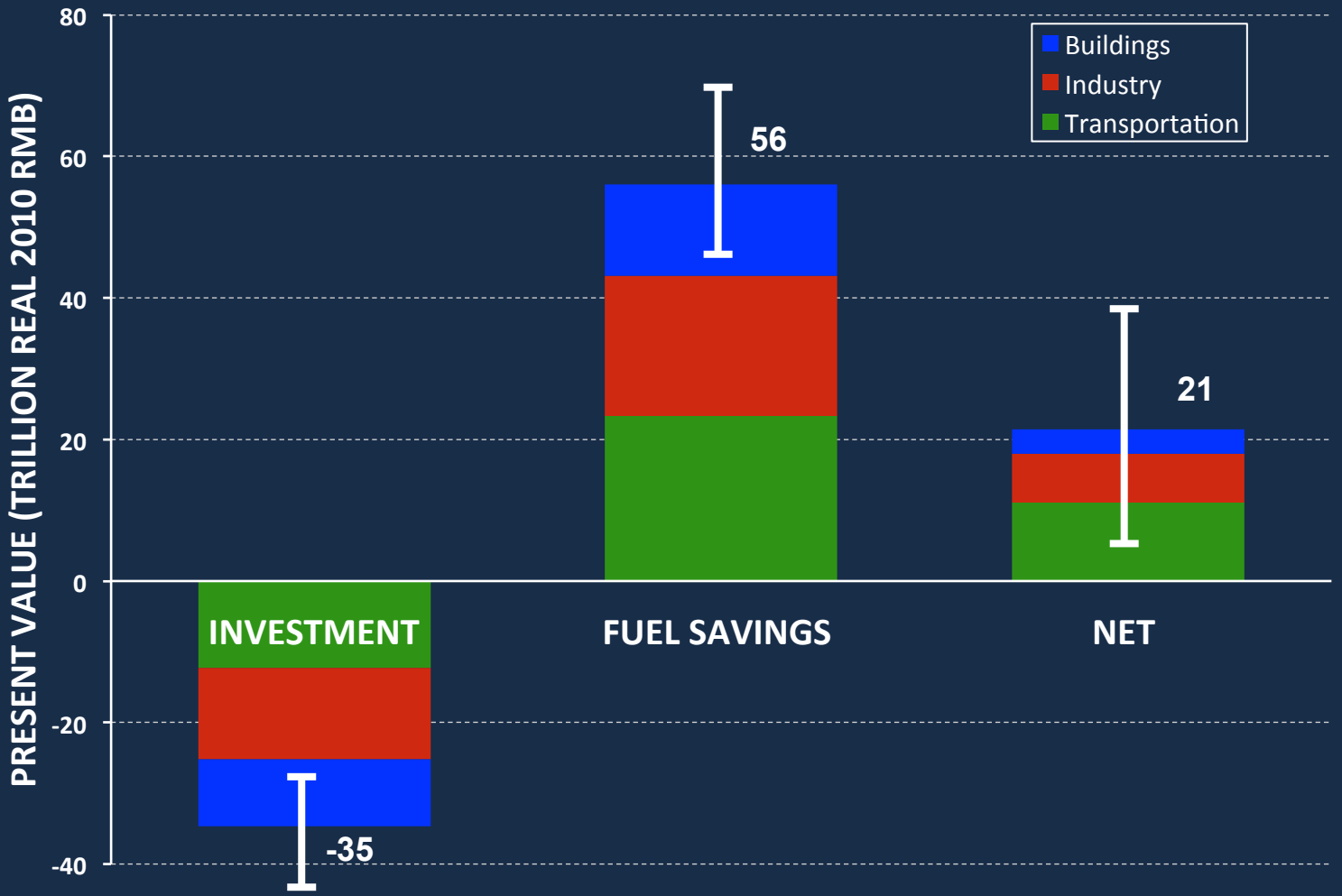
Source: Reinventing Fire: China team analysis

ADDITIONAL REDUCTIONS IN ENERGY-RELATED AIR POLLUTION



Source: Energy Research Institute emissions calculations; Reinventing Fire: China team analysis.

ACCOMPLISHED USING AVAILABLE, COST-EFFECTIVE SOLUTIONS



Source: Reinventing Fire: China team analysis.

THREE PHASES OF CHINA'S ENERGY REVOLUTION

INCREASING GDP, ENERGY PRODUCTIVITY, CARBON PRODUCTIVITY

Phase 1:
Waging a war on pollution; post-industrial transition

Phase 2:
Peaking CO_2 emissions and post-industrial growth

Phase 3:
Green and intelligent development, completing low carbon energy transition

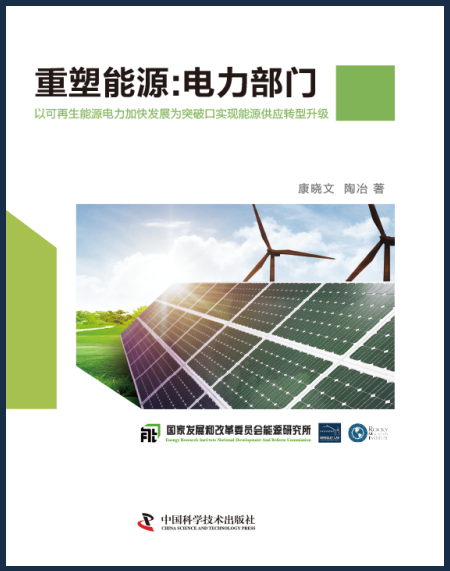
Timing	2010-2020	2020-2030	2030-2050
Targets	• Peak coal by 2020 • Peak industrial CO_2 emissions by 2020 • 25% reduction in SO_2, NO_X from 2010	• Peak oil demand by 2030 • Peak national CO_2 emissions by 2030 • CO_2 emissions per GDP decrease 70% from 2005 levels	• Primary energy peaks and then drops to around 3.8 billion tons, higher than 2010 • Building and transportation sector CO_2 emissions peak around 2040 • CO_2 emissions drop to 5 GT by 2050

DECREASING EMISSIONS

CONCLUSIONS AND RECOMMENDATIONS

- Launch Reinventing Fire Strategy to facilitate low-carbon transformation
- Expand energy efficiency as the First Fuel
- Facilitate solution deployment to improve energy productivity by 6 times, carbon productivity by 13 times
- Promote development of electrified, low-carbon energy system
- Promote integrative design and upgrade infrastructure
- Facilitate commercial innovation and build dynamic markets
- Unleash reform and ecological dividend through institutional transformation

PUBLICATIONS



A MODEL FOR INTERNATIONAL COLLABORATION

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